New York University

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Study of Transonic Flow Over Swept Wings

Final Technical Report

The contract was initiated as part of an effort to design shockless airfoils that would be appropriate for experimental work on R. T. Jones' concept of a supersonic transport with an oblique wing. This led to the early development of a series of computer codes for the design and analysis of airfoils and wings in two-dimensional and three-dimensional transonic flow. These were the first codes of their kind to become widely accepted by the aircraft industry as a primary design tool. The codes eventually came to supersede two-dimensional testing of airfoils in the transonic regime. The NYU oblique wing 3-D code was the forerunner of the later swept wing code FL022, which achieved wide recognition. Work currently continues on improved methodology for such codes. More specifically, we have developed techniques to incorporate the effect of an engine or fuselage in the inverse design code FL22INV while using a minimum of computer resources.

List of Publications:

Supercritical Wing Sections II, by Frances Bauer, Paul Garabedian, David Korn and Antony Jameson, Springer-Verlag, Volume 108, 1975.

Accelerated Iteration Schemes for Transonic Flow Calculations Using Fast Poisson Solvers, by Antony Jameson, March 1975 (COO-3077-82).

Computation of Wave Drag for Transonic Flow, by P. R. Garabedian, Journal D'Analyse Mathematique (1976).

A Systematic Method for Computer Design of Supercritical Airfoils in Cascade, by Paul Garabedian and David Korn, Communications on Pure and Applied Mathematics (1976).

Implicit Approximate-Factorization Schemes for the Efficient Solution of Steady Transonic Flow Problems, by W. F. Ballhaus, A. Jameson, and J. Albert, NASA Technical Memorandum X-73,202, January 1977.

A Brief Description of the Jameson-Caughey NYU Transonic Swept-Wing Computer Program - FLO22, by A. Jameson, D. A. Caughey, Perry A. Newman, and Ruby M. David, NASA TM X-73996, December 1976.

Transonic Flow Theory of Airfoils and Wings by P. R. Garabedian, 13th Annual Meeting, November 1 - 3, 1976, Society of Engineering Science, Hampton, Va.

Transonic Flow Past a Swept Wing, by Antony Jameson and D. A. Caughey, June 1977 (COO-3077-140).

A Well Posed Boundary Value Problem in Transonic Gas Dynamics, by Jose M. Sanz, February 1978 (COO-3077-149).

Numerical Calculation of Transonic Flow Past a Swept Wing By a Finite Volume Method, by Antony Jameson, Third IFIP Conference on Computing Methods in Applied Science and Engineering, Versailles, France, December 1977.

Supercritical Wing Sections III by Frances Bauer, Paul Garabedian and David Korn, Springer-Verlag Lecture Notes in Economics and Mathematical Systems, Volume 150, December 1977.

A Well Posed Boundary Value Problem in Transonic Gas Dynamics by Jose M. Sanz, Communications on Pure and Applied Mathematics, Vol. XXXI, 671-679 (1978).

An Artificial Viscosity Method for the Design of Supercritical Airfoils, by Geoffrey B. McFadden, July 1979 (COO-3077-158).

Shockless Airfoils for Wings, Compressors, and Turbines, by P. R. Garabedian, Nonlinear Partial Differential Equations in Engineering and Applied Science edited by Sternberg, Kalinowski and Papadakis, published by Marcel Dekker, Inc. 1980.

Design of Supercritical Swept Wings by P. Garabedian and G. McFadden, AIAA Journal, Vol. 20, No. 3, March 1982.

Accelerated Finite-Volume Calculation of Transonic Potential Flows by Antony Jameson, D. A. Caughey, et al, which came out in a book Notes on Numerical Fluid Mechanics, Volume 3 (A GAMM Workshop) 1981.

Theory, Computation, and Application of Exponential Splines, by Brian J. McCartin, October 1981 (DOE/ER/03077-171).

Computational Fluid Dynamics of Airfoils and Wings, by P. Garabedian and G. McFadden, symposium at Mathematics Research Center, Univ. Wisconsin-Madison, May 13-15, 1981 (Transonic, Shock, and Multidimensional Flows: Advances in Scientific Computing, pp. 1-15, Academic Press, 1982).

An Analysis of Three-Dimensional Transpnic Compressors, by Antoine Bourgeade, February 1983 (DOE/ER/03077-180).